WATER RESOURCES REVIEW for

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CANADA
DEPARTMENT OF THE ENVIRONMENT
INLAND WATERS BRANCH

MAY
1972

STREAMFLOW AND GROUND-WATER CONDITIONS

Streamflow was above median for May in nearly the entire area comprising southern Canada and the northern half of the United States, as well as in the Carolinas and in a few smaller areas. Delayed snowmelt runoff contributed to high flows in some northern, mountain-fed streams. In the southern Midcontinent, severe flooding in south-central Texas was caused by unusually heavy rains in early May along the Comal and Guadalupe Rivers. Flooding elsewhere in the United States was minor or moderate, caused in most cases by locally intense spring storms.

Dry conditions persisted in much of the southern area of the West and Midcontinent regions. However, low streamflows did not yet have major impact on availability of water supplies in most parts of the affected area because of the substantial quantities of water still contained in reservoirs. Parts of southern Arizona and California, for example, had had above-normal runoff and inflow to reservoirs during the winter, thus in part offsetting the receding flow conditions of recent months. Ground-water withdrawals were also being utilized in some areas that might otherwise soon be experiencing water shortages.

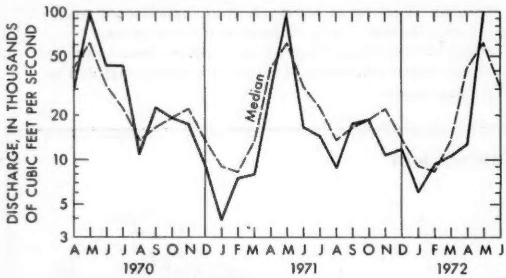
CONTENTS OF THIS ISSUE: Northeast, Southeast, Western Great Lakes region, Midcontinent, West, Alaska; New publications of the Geological Survey; Flow of major rivers during May 1972; Usable contents of selected reservoirs near end of May 1972; Annual reports on quality of surface waters in the United States, 1941–67; Flood-plain maps published in the hydrologic atlas series; Water quality of streams in the Neshaminy Creek basin, Pennsylvania.

NORTHEAST

[Atlantic Provinces and Quebec; Delaware, Maryland, New York, New Jersey, Pennsylvania, and the New England States]

ABOVE-NORMAL STREAMFLOWS CHARACTERIZED NEARLY THE ENTIRE REGION. STREAMFLOW INCREASED THROUGHOUT THE MARITIME PROVINCES AND QUEBEC. THE PATTERN OF INCREASES AND DECREASES WAS MIXED IN OTHER PARTS OF THE NORTHEAST.

In southeastern Quebec Province, monthly and daily mean discharges of St. Francois River at Hemming Falls (drainage area, 3,660 square miles) were highest for May in the 46 years of record—29,900 cfs and 56,000 cfs (on the 5th), respectively. To the north, the discharge of St. Maurice River at Grand'Mere was also very high for the month—nearly eight times the flow of the preceding month (see graph).

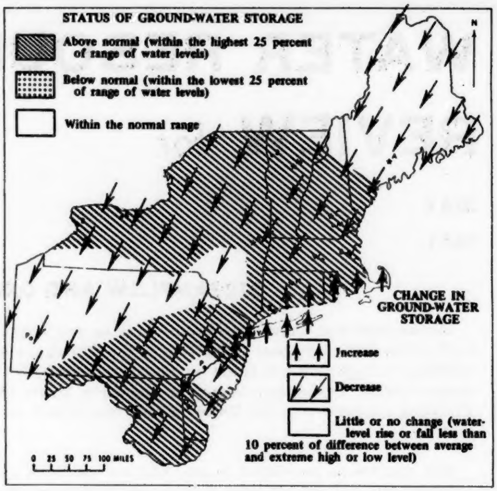


Monthly mean discharge of St. Maurice River at Grand'Mere, Quebec (Drainage area, 16,200 square miles.)

In the Maritime Provinces, monthly flows were record high for May at three index stream-gaging stations: (1) Lepreau River at Lepreau, New Brunswick, 1020 cfs (drainage area, 92.1 square miles; 56 years of record); (2) LaHave River at West Northfield, Nova Scotia, 4,150 cfs (drainage area, 484 square miles; 57 years of record); (3) St. Mary's River at Stillwater, Nova Scotia, 6,020 cfs (drainage area, 523 square miles; 57 years of record).

In high elevations of Vermont, New Hampshire, and western Massachusetts, rapid melting of the remaining above-average snow cover, coupled with a general storm of 1½–3 inches of rain on May 3–6, resulted in high peak discharges about May 5, especially in northeastern Vermont. On Passumpsic River at Passumpsic, the discharge was highest since March 1936. The peak discharge on Winooski River at Montpelier was the highest in 20 years. Monthly discharge at index station Pemigewasset River at Plymouth, New Hampshire (drainage area, 622 square miles), was 5,399 cfs—highest for the month in 69 years of record.

A somewhat similar situation prevaled in mountain-fed streams in northern New York, where abnormally high flows were attributed to late snowpack runoff combined with above-normal rainfall. Daily mean dis-



Map above shows ground-water storage near end of May and change in ground-water storage from end of April to end of May.

charge of West Branch Oswegatchie River near Harrisville (drainage area, 258 square miles), was highest for May—4,190 cfs on the 4th—in the 56 years of record.

Ground-water levels declined in most of the region but remained in the above-normal range in central New England and several other large areas (see map). Month-end levels were highest of record for May in 25 (of 47) observation wells in Massachusetts, in 3 (of 15) wells in Rhode Island, and in 2 (of 28) wells in New Hampshire. In Connecticut, also, monthend levels in many wells were at or near highest May levels of record.

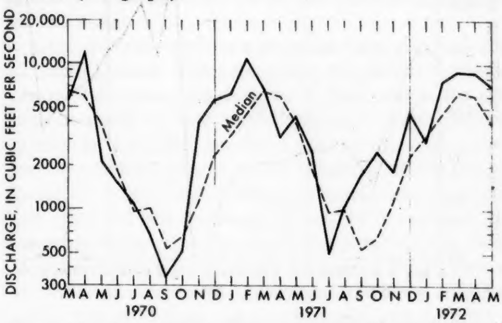
SOUTHEAST

[Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia]

STREAMFLOW INCREASED IN PARTS OF VIRGINIA, NORTH CAROLINA, FLORIDA, GEORGIA, AND MISSISSIPPI, AND DECREASED ELSEWHERE IN THE REGION. MONTHLY MEAN DISCHARGES WERE IN THE ABOVE-NORMAL RANGE IN A LARGE AREA CENTERED ON NORTH CAROLINA, AND WERE BELOW THE NORMAL RANGE IN SOUTHEASTERN ALABAMA AND THE ADJACENT AREA OF SOUTHWEST GEORGIA. MINOR FLOODING OCCURRED IN MANY SECTIONS OF VIRGINIA, THE WESTERN PIEDMONT AREA OF NORTH CAROLINA, AND IN NORTHEASTERN AND SOUTHWESTERN ALABAMA.

In West Virginia, flow of Potomac River at Paw Paw decreased seasonally but continued in the above-normal range for the 3d consecutive month.

It has been above the median in 9 of the last 10 months (see graph).



Monthly mean discharge of Potomac River at Paw Paw, W. Va. (Drainage area, 3,109 square miles.)

In Virginia, monthly mean discharges were above the normal range at all index stations except in the southwest. Flash flooding occurred in many sections of the State but no serious damage was reported.

In the western Piedmont area of North Carolina, some lowland flooding occurred May 13–14 as a result of rainfall of up to 4 inches preceded by lesser rains on May 3–4 and 8–9. Flood damage was limited to erosion and silt deposition on farmland. Highest monthly and daily discharges for the month occurred on South Yadkin River near Mocksville, 779 cfs and 2,900 cfs (on 15th), respectively (drainage area, 313 square miles; gaged since October 1938).

In Alabama, locally heavy rains during the first half of May caused minor floods in the extreme northeast, near Centre, and in the southwest, near Mobile. Recurrence intervals for these flood peaks were about 2 years.

In Florida, streamflow was in the normal range at all index stations. Flow of Silver Springs, in the north-central part of the State, increased to 770 cfs, 98 percent of normal. In the southeastern part, flow southward through the Tamiami Canal outlets, 40-mile bend to Monroe, increased 16 cfs, to 56 cfs, almost 27 times the normal flow for May. Flow of Miami Canal at Miami increased by 43 cfs, to 185 cfs, 124 percent of normal.

Ground-water levels declined seasonally in most parts of West Virginia, Kentucky, Alabama, Georgia (in the Piedmont), and in central and northern Florida (except at Orlando). Levels fell also in the Sparta Sand in the Jackson, Miss., area. Levels rose in North Carolina and in southeastern Florida. Monthend levels were above average in Alabama and North Carolina, except in several heavily pumped areas in the Coastal Plain. Levels were near or above average in southeastern Florida and in much of West Virginia; and were below average in northern and central Florida (except at Orlando), and in Kentucky except in undeveloped aquifers recharged by infiltration from adjacent high-stage streams.

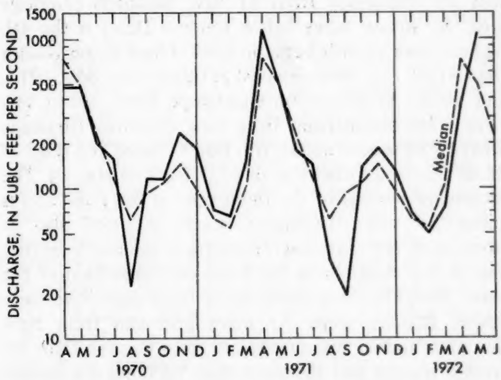
WESTERN GREAT LAKES REGION

[Ontario; Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin]

FLOWS GENERALLY DECREASED EXCEPT IN ONTARIO AND NORTHERN MICHIGAN. STREAMFLOW THROUGHOUT THE REGION WAS IN OR ABOVE THE NORMAL RANGE.

Above-normal streamflow persisted in parts of Minnesota, Wisconsin, and Ohio. Flow was in the above-normal range at the index station Crow River at Rockford in east-central Minnesota for the twentieth consecutive month.

Streamflow increased in most of Ontario and was especially high in an area adjoining the northern shores of Lake Huron. A new 57-year maximum daily discharge for May was recorded on North Magnetawan River near Burk's Falls (drainage area, 129 square miles) in the Parry Sound Region—1,780 cfs on the 5th. Above-normal runoff by tributaries to Lake Superior was caused by late melting of the remaining snowpack; flooding was minimal. In Michigan's Upper Peninsula, monthly mean discharge of Sturgeon River at Sidnaw, was 3d highest for May in the 33 years of record (see graph).



Monthly mean discharge of Sturgeon River near Sidnaw, Mich. (Drainage area, 171 square miles.)

Ground-water levels in water-table wells rose in Wisconsin and northern Minnesota; remained about the same or declined slightly in Ohio and northern Indiana; and declined in southern Minnesota and central and southern Indiana. Monthend levels continued above average in Minnesota and were above average also in Michigan. Levels remained near average in Indiana and Ohio. Levels declined in wells tapping artesian aquifers in the Milwaukee, Wis., area, and in the Minneapolis–St. Paul, Minn., area.

MIDCONTINENT

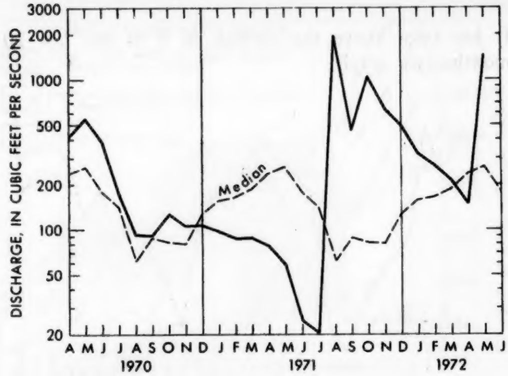
[Manitoba and Saskatchewan; Arkansas, Iowa, Kansas, Louisiana, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas]

STREAMFLOW INCREASED IN PARTS OF ALL STATES AND PROVINCES IN THE REGION; AND WAS GENERALLY IN THE ABOVE-NORMAL RANGE IN THE NORTHERN HALF, AND IN SOUTH-CENTRAL TEXAS AND SOUTHEASTERN LOUISIANA. LOCALLY HEAVY RAINS CAUSED FLOODING IN SOME BASINS OF NORTH DAKOTA, IOWA, NEBRASKA, MISSOURI, LOUISIANA, AND TEXAS. FLOWS CONTINUED IN THE BELOW-NORMAL RANGE FOR THE FOURTH CONSECUTIVE MONTH IN ARKANSAS AND ADJACENT AREAS OF SOUTHEASTERN OKLAHOMA, NORTHEASTERN TEXAS, AND NORTHWESTERN LOUISIANA.

Severe flooding occurred on Comal and Guadalupe Rivers in south-central Texas during the early part of May. At least 16 persons drowned and total damage was estimated to be 15 million dollars. The peak stage of 36.55 feet observed on Comal River at New Braunfels (drainage area, 130 square miles) on May 12, was the highest since the gage was established in 1932. The corresponding peak discharge of 35,000 cfs has a recurrence interval of about 25 years. The peak stage of 31.65 feet on Guadalupe River at New Braunfels (drainage area, 86 square miles below Canyon Dam) is the 4th highest since records began in 1869. Flood stages greater than 31.65 feet were observed at this site in 1869, 1913, and 1935. At Cuero, on Guadalupe River, about 180 river miles downstream from New Braunfels (drainage area, 4,934 square miles), this flood crested at a stage of 36.88 feet and a discharge of 63,000 cfs on May 14. The recurrence interval of the flood peak at this point also is about 25 years. Damaging floods occurred also at Houston in the southeast, Henrietta in the north-central, and at San Antonio in the south-central section of the State. Monthly mean discharge of Guadalupe River near Spring Branch, some 53 miles upstream from New Braunfels and 31 miles upstream from Canyon Dam, increased sharply and was more than 5½ times the median for May (see graph). Comal Springs at New Braunfels, had a discharge of 385 cfs near monthend.

Minor flooding, caused by locally heavy rainfall, occurred at scattered locations in Iowa, Missouri, and Louisiana during the early part of May, and in North Dakota and Nebraska later in the month. Monthly mean discharge at one index station each in Iowa and North Dakota was highest of record for May: 3,370 cfs on Big Sioux River at Akron (drainage area, 9,030 square miles) in northwestern Iowa, and 1,980 cfs on Cannonball River at Breien (drainage area, 4,100 square miles) in southwestern North Dakota.

Drought conditions have reduced streamflow in contiguous parts of Arkansas, Oklahoma, Texas, and



Monthly mean discharge of Guadalupe River near Spring Branch, Tex. (Drainage area, 1,315 square miles.)

Louisiana since February 1972. Cumulative runoff of Saline Bayou near Lucky, in northern Louisiana, and of Saline River near Rye, in adjacent southern Arkansas, was roughly one third and one sixth, respectively, of the median cumulative runoff for the two sites for the 4-month period February through May. For the water year to date, October through May, cumulative runoff of Saline River near Rye has been only 29 percent of median. In adjacent eastern Texas, cumulative runoff of Neches River near Rockland was about one fourth of the median for the period February through May, and 33 percent of the median for the water year to date. Also, in eastern Texas, about 200 miles west of Rockland, monthly mean flow of North Bosque River near Clifton was only 20 percent of the median for May. Because of above-normal runoff at this station during the four-month period, October 1971 through January 1972, cumulative runoff for the water year through May was 176 percent of median. In contrast, North Concho River near Carlsbad, in western Texas, was dry from November 19, 1971 to May 6, 1972 and the cumulative runoff from the 1,249-square-mile drainage area for the water year to date (8 months) was 4 percent of the median. Roughly 80 percent of the water-year runoff to date occurred in a period of 7 days in May.

In southwestern Oklahoma, monthly mean discharge of Washita River near Durwood, increased and was more than 5 times the flow during April but was still only 63 percent of median for May. Cumulative runoff at that site for the water year to date is 181,000 acre-feet less than the median. Dry conditions in the State were somewhat alleviated by rainfall during May.

In Manitoba, monthly mean discharge of Waterhen River below Waterhen Lake was in the above-normal range and 50 percent greater than the median for May. Cumulative runoff from this watershed for the water year to date has been 64 percent above the median for the reference period, 1952–67. The level of Lake Winnipeg at Gimli, averaged 716.29 feet above mean sea

level during May, 2.85 feet above the long-term mean and 0.35 foot less than the 59-year maximum monthly mean for May.

Ground-water levels in water-table wells generally rose in North Dakota, Nebraska, and in the terrace aquifer of central Louisiana; and declined in Iowa and in the rice-irrigation area of east-central Arkansas. Levels declined rapidly in the Chicot aquifer in the rice-irrigation area of southwestern Louisiana. In the industrial aquifer (Sparta Sand) of central and southern Arkansas, levels declined and remained below average, but at El Dorado were considerably higher than the record-low levels of May 1968. Monthend levels were above average in North Dakota and Nebraska except in heavily pumped areas. In Texas, levels rose at El Paso and San Antonio, and declined at Austin and Houston. Monthend levels were above average at Austin and San Antonio, and were lowest of record for May in the Evangeline aquifer at Houston and in the bolson deposits at El Paso.

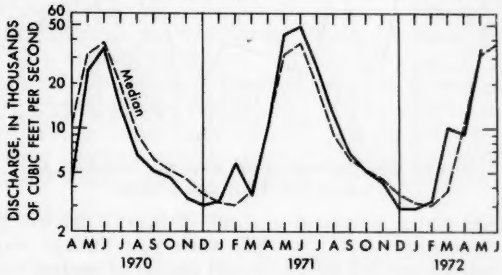
WEST

[Alberta and British Columbia; Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming]

STREAMFLOW GENERALLY INCREASED IN HIGH-ALTITUDE BASINS OF THE NORTHERN PART OF THE REGION, INCLUDING COLORADO AND UTAH, BUT DECREASED IN THE SOUTHERN PART, INCLUDING NORTHERN CALIFORNIA AND NEVADA. SNOWMELT CONTRIBUTED TO THE INCREASED FLOW BUT BELOW-AVERAGE TEMPERATURES SLOWED THE RATE OF MELTING OF THE HEAVY SNOWPACK AND A POTENTIAL FLOOD HAZARD REMAINS AT MONTHEND, ESPECIALLY IN IDAHO AND MONTANA. FLOWS CONTINUED IN THE BELOW-NORMAL RANGE ACROSS THE SOUTHERN PART OF THE REGION AND IN SOUTHERN WYOMING AND NORTHERN COLORADO.

Melting of the unusually heavy snowpack in the mountains of northern Washington resulted in the highest monthly and daily discharges——11,140 cfs and 21,800 cfs (on the 30th), respectively——since records began in September 1928, on Skyomish River near Gold Bar (drainage area, 535 square miles). Flow of Spokane River at Spokane, in the mountains of western Washington, also increased into the above-normal range. Monthly flows of these two streams have been above the normal range during three of the last four months. Monthly mean flow of Fraser River at Hope, British Columbia, was more than 3 times the April median, roughly 40 percent greater than the median for the month, and in the above-normal range for the third consecutive month.

In Idaho, streamflow increased seasonally, from snowmelt, and was above the normal range on Snake River in the southeast, Boise River in the southwest, Coeur d'Alene River in the north, and Clearwater River in the central part of the State. In adjacent Montana, streamflow also increased seasonally but remained in the normal range (see graph for Kootenai River at Libby). In



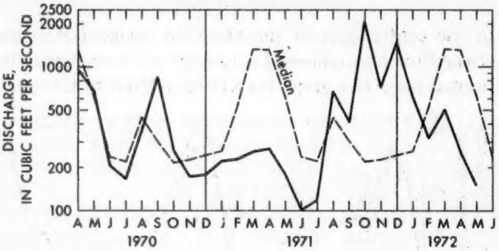
Monthly mean discharge of Kootenai River at Libby, Mont. (Drainage area, 10,240 square miles.)

both States, below-average temperatures retarded melting of the heavy snowpack at high altitudes, thereby increasing the potential for flooding in June. Snowpack is especially heavy in Montana at high elevations of the Kootenai River and Clark Fork drainages, and along the eastern slopes of the Continental Divide.

The area of below-normal streamflow that developed during February in the southwest corner of the region has expanded to include parts of 7 States in the West and 2 adjacent States in the Midcontinent region.

Flows at all index streamflow stations in New Mexico decreased and continued in the below-normal range for the second consecutive month. Reservoir storage also continued to be far below normal. Monthly mean flows of Pecos River at Santa Rosa, 9.51 cfs (drainage area, 2,650 square miles), and Rio Grande at Otowi Bridge near San Ildefonso, 398 cfs (drainage are, 14,300 square miles; discharge adjusted for change in storage in upstream reservoirs) were the lowest for May in 56 and 71 years, respectively. Locally heavy rains on May 29 in the north-central part of the State and isolated showers elsewhere caused no significant increases in streamflow.

In Arizona, flows at 5 of the 6 index stations decreased; the sixth, Little Colorado River near Cameron, remained dry, as it has been since February 26, 1972. Monthly mean flow of Salt River near Roosevelt has been below the median since February 1972, and was the second lowest for May in 60 years (see graph). Monthly flows have been in the below-normal range at 2 of the stations for four consecutive months and at 2 stations for 3 consecutive months. The precipitation deficiency in the State was especially severe at Phoenix where a new record of 144 days without measurable precipitation was established May 21; the previous record was set in 1960. No appreciable rainfall is expected in Arizona until July but reservoir contents generally are equal to or greater than those of a year ago, and contents of the reservoirs in the Salt-Verde system now are equivalent to about 18 months' supply. Streamflow during the period October through December 1971



Monthly mean discharge of Salt River near Roosevelt, Ariz. (Drainage area, 4,310 square miles.)

was above normal as a result of heavy rains, hence, cumulative runoff for 1972 water year through May ranges from 112 percent to 154 percent of median at 4 of the 6 index stations despite the low flows of recent months.

The lack of precipitation has also been severe in southern Utah where only one or two light storms have occurred since December 28, 1971. In the southwestern part of the State, monthly mean discharge of Beaver River near Beaver (drainage area, 82 square miles), was 37.7 cfs, lowest for May in the 59 years of record. The elevation of Great Salt Lake rose 0.15 foot (to 4,199.70 feet above mean sea level) during the first half of the month, and then declined to 4,199.60 feet at monthend. The rise of 4.75 feet from October 1970 to May 1972 is the greatest for a comparable period since records began in 1850.

In California, streamflow was near the below-normal range in the north and in that range in the south. Precipitation for the water year to date (8 months), has averaged only 50 percent of normal for the State and 39 percent of normal in the southeastern interior area. The precipitation at Red Bluff, in north-central California, was reported to be the lowest since the 1800's. The lowest potential spring runoff (May through July) of record is forecast by the California Department of Water Resources for Kern, Tule, and Kings Rivers, in the Tulare and Buena Vista Lake basins in the southeastern interior. In spite of the dry-weather conditions in the State, the effects on water supply have been minimal to date because of the large storage capacity of reservoirs aided by substantial inflow during preceding wet seasons. Additional supplies are available from ground water and importation of water from other areas. In north-central Colorado, monthly mean discharge of Clear Creek near Golden (drainage area, 399 square miles), was 174 cfs, lowest for May in the 62 years of record.

Ground-water levels rose in Montana and eastern Washington; and declined in Utah, western Washington, and southern parts of California, Arizona, and New Mexico. Monthend levels were above average in Washington, Montana, and in Utah at Blanding (in southeastern corner and Logan (in northeast). Monthend levels remained about the same in southern California; and continued to fall in southern Arizona and New Mexico (a notable exception was a rise of almost 3 feet recorded in the intake area of the Rosewell artesian basin). In southern Idaho, the level of the observation well penetrating the sand and gravel aquifer in the Boise Valley began the seasonal rise and was above average; whereas the level in the well in the Rupert-Minidoka area (basalt aquifer) continued to decline and was below average.

ALASKA

Streamflow increased seasonally at all index stations in the State but continued below the normal range for the second consecutive month on Little Susitna River near Palmer in south-central Alaska, and on Sheep Creek near Juneau in the southeast, because of below-normal temperatures which delayed snowmelt at the higher elevations. Monthly mean flow of Kenai River at Cooper Landing on Kenai Peninsula south of Anchorage, was more than 2½ times the April mean flow, but was only 50 percent of the May median and in the below-normal range for the month. Localized flooding from ice jams occurred on many streams in the Fairbanks area; however, the monthly mean flow of Chena River at Fairbanks was only 32 percent above the median for May. Ice-jam flooding occurred also in western Alaska at McGrath and Aniak on the Kuskokwim River and along the lower Yukon River.

Ground-water levels in the Anchorage area and on Kenai Peninsula rose seasonally in shallow aquifers and changed only slightly in the artesian aquifers.

NEW PUBLICATIONS OF THE GEOLOGICAL SURVEY

The water-resources, hydrologic, and environment-related reports listed below are among those that have been published or reprinted within recent months by the Geological Survey. Single copies of Circulars 642 and 645 are available without charge by request to U.S. Geological Survey, 1200 South Eads Street, Arlington, Va. 22202. *All other reports listed below* may be obtained by purchase only (at the prices indicated) from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

CIRCULARS:

Streamflow, sediment-transport, and water-temperature characteristics of three small watersheds in the Alsea River basin, Oregon, by D.D. Harris and R.C. Williams: U.S. Geological Survey Circular 642. 1971. 21 pages.

A procedure for evaluating environmental impact, by L.B. Leopold, F.E. Clark, B.B. Hanshaw, and J.R. Balsley: U.S. Geological Survey Circular 645. 1971. 13 pages.

WATER-SUPPLY PAPERS:

Physical, chemical, and biological aspects of the Duwamish River estuary, Kings County, Wash., by J.F. Santos and J.D. Stoner: U.S. Geological Survey Water-Supply Paper 1873-C. 1972. 74 pages. $0.40.

DUE TO A LACK OF PHOTOGRAPHIC CONTRAST BETWEEN TEXT AND BACKGROUND, THIS PAGE DID NOT REPRODUCE.

Geology and water resources of the Bitterroot Valley, southwestern Montana, by R.G. McMurtrey, R.L. Konizeski, M.V. Johnson, and J.H. Bartells, with a section on *Chemical quality of water,* by H.A. Swenson: U.S. Geological Survey Water-Supply Paper 1889. 1972. 80 pages. $1.00.

Availability of water in Kalamazoo County, southwestern Michigan, by W.B. Allen, J.B. Miller, and W.W. Wood: U.S. Geological Survey Water-Supply Paper 1973. 1972. 129 pages. $6.25.

Sediment transport and turbidity in the Eel River basin, California, by W.M. Brown III and J.R. Ritter: U.S. Geological Survey Water-Supply Paper 1986. 1971 (1972). 70 pages. $0.50.

Factors contributing to unusually low runoff during the period 1962–68 in the Concho River basin, Texas, by S.P. Sauer: U.S. Geological Survey Water-Supply Paper 1999-L. 1972. 48 pages. $0.35.

Model hydrographs, by W.D. Mitchell: U.S. Geological Survey Water-Supply Paper 2005. 1972. 85 pages. $0.45.

Estimating steady-state evaporation rates from bare soils under conditions of high water table, by C.D. Ripple, Jacob Rubin, and T.E.A. van Hylkama: U.S. Geological Survey Water-Supply Paper 2019-A. 1972. 39 pages. $0.30.

Provisional data; subject to revision

FLOW OF MAJOR RIVERS DURING MAY 1972

River and location	Drainage area (square miles)	Mean annual discharge through September 1970 (cfs)	May 1972: Monthly mean discharge (cfs)	May 1972: Percent of median monthly discharge[1]	May 1972: Change in discharge from previous month (percent)	Discharge near end of month (cfs)	Discharge near end of month (mgd)	Date
St. Lawrence River at Lake St. Lawrence[2]	295,200	239,100	290,800	114	+ 6	294,000	190,000	31
Delaware River at Trenton, N.J	6,780	11,360	18,700	128	- 19	9,060	5,860	29
Susquehanna River at Harrisburg, Pa	24,100	33,670	65,940	130	- 22	22,700	14,700	31
Potomac River near Washington, D.C	11,560	10,650	26,000	195	+ 4	15,000	9,700	31
Altamaha River at Doctortown, Ga	13,600	13,380	8,294	78	- 46	10,000	6,460	23
Tombigbee River near Coatopa, Ala[3]	15,400	22,160	11,950	89	- 25	6,200	4,010	23
Missouri River at Hermann, Mo	528,200	77,480	114,100	126	+ 45	80,000	51,800	26
Ohio River at Louisville, Ky[4]	91,170	110,600	134,200	107	- 63	39,700	25,700	29
Mississippi River near Vicksburg, Miss[5]	1,144,500	552,700	1,007,000	122	+ 36	630,000	407,000	31
Colorado River near Grand Canyon, Ariz	137,800	....	14,920	......	+ 12	....	....	.....
Columbia River at The Dalles, Oreg[6]	237,000	194,000	579,100	148	+146	....	....	.....
Fraser River at Hope, British Columbia	78,300	95,300	228,000	139	+208	336,000	217,000	30

[1] Reference period 1931–60 or 1941–70.

[2] Records furnished by Department of the Army, Corps of Engineers, Buffalo District. Discharges shown are considered to be the same as those at Ogdensburg, N.Y., which is directly opposite Prescott, Ontario.

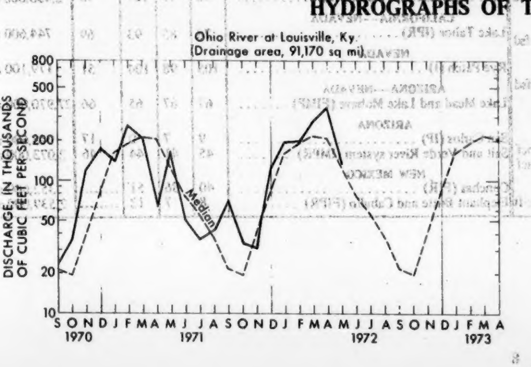
[3] At Demopolis lock and dam.

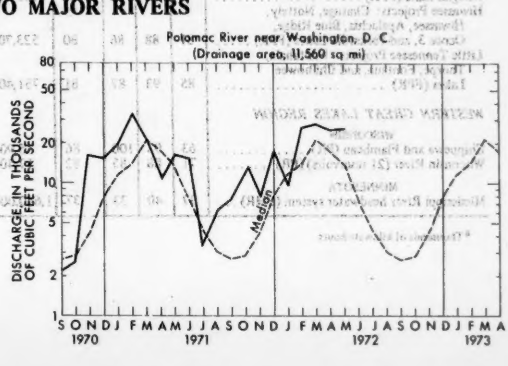
[4] Records furnished by U.S. Army, Corps of Engineers.

[5] Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.

[6] Discharge (adjusted for upstream storage) determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

HYDROGRAPHS OF TWO MAJOR RIVERS





Provisional data; subject to revision

USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF MAY 1972

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of Apr. 1972	End of May 1972	End of May 1971	Average for end of May	Normal maximum
	Percent of normal maximum				
NORTHEAST REGION					
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	72	99	96	76	223,400 (a)
QUEBEC					
Gouin (P)	29	42	73	66	6,487,000 ac-ft
Allard (P)	56	91	96	86	280,600 ac-ft
MAINE					
Seven reservoir systems (MP)	28	97	97	88	179,300 mcf
NEW HAMPSHIRE					
Lake Winnipesaukee (PR)	90	104	103	100	7,200 mcf
Lake Francis (FPR)	25	88	80	80	4,326 mcf
First Connecticut Lake (P)	8	95	92	86	3,330 mcf
VERMONT					
Somerset (P)	71	94	85	85	2,500 mcf
Harriman (P)	60	78	82	87	5,060 mcf
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	95	94	94	90	3,394 mcf
NEW YORK					
Great Sacandaga Lake (FPR)	87	100	99	97	34,270 mcf
Indian Lake (FMP)	59	106	104	103	4,500 mcf
New York City reservoir system (MW)	102	100	100	....	547,500 mg
NEW JERSEY					
Wanaque (M)	100	100	100	94	27,730 mg
PENNSYLVANIA					
Wallenpaupack (P)	88	90	91	85	6,875 mcf
Pymatuning (FMR)	105	100	98	99	8,191 mcf
MARYLAND					
Baltimore municipal system (M)	101	100	101	93	85,340 mg
SOUTHEAST REGION					
NORTH CAROLINA					
Bridgewater (Lake James) (P)	85	98	94	91	12,580 mcf
High Rock Lake (P)	76	90	78	81	10,230 mcf
Narrows (Badin Lake) (P)	100	104	103	101	5,616 mcf
SOUTH CAROLINA					
Lake Murray (P)	89	96	98	80	70,300 mcf
Lakes Marion and Moultrie (P)	82	92	90	76	81,100 mcf
SOUTH CAROLINA--GEORGIA					
Clark Hill (FP)	74	77	81	74	75,360 mcf
GEORGIA					
Burton (PR)	91	99	98	92	104,000 ac-ft
Lake Sidney Lanier (FMPR)	62	65	63	67	1,686,000 ac-ft
Sinclair (MPR)	94	95	92	94	214,000 ac-ft
ALABAMA					
Lake Martin (P)	94	100	99	94	1,373,000 ac-ft
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	79	77	81	61	1,166,000 cfsd
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	81	88	75	67	1,452,000 cfsd
Douglas Lake (FPR)	76	85	70	67	715,800 cfsd
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	81	88	86	80	523,700 cfsd
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	85	93	87	81	751,400 cfsd
WESTERN GREAT LAKES REGION					
WISCONSIN					
Chippewa and Flambeau (PR)	63	93	100	86	15,900 mcf
Wisconsin River (21 reservoirs) (PR)	71	88	85	82	17,400 mcf
MINNESOTA					
Mississippi River headwater system (FMR)	37	40	33	37	1,640,000 ac-ft
MIDCONTINENT REGION					
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	95	93	90	....	22,640,000 ac-ft
NEBRASKA					
Lake McConaughy (IP)	94	90	97	78	1,948,000 ac-ft
OKLAHOMA					
Keystone (FPR)	80	89	84	97	661,000 ac-ft
Lake O' The Cherokees (FPR)	90	94	96	92	1,492,000 ac-ft
Tenkiller Ferry (FPR)	97	97	92	101	628,200 ac-ft
Lake Altus (FIMR)	21	24	18	66	134,500 ac-ft
Eufaula (FPR)	83	86	81	87	2,378,000 ac-ft
OKLAHOMA--TEXAS					
Lake Texoma (FMPRW)	80	90	80	104	2,722,000 ac-ft
TEXAS					
Possum Kingdom (IMPRW)	93	97	59	84	724,500 ac-ft
Buchanan (IMPW)	95	96	78	85	955,200 ac-ft
Bridgeport (IMW)	61	87	71	70	270,900 ac-ft
Eagle Mountain (IMW)	88	92	88	91	182,700 ac-ft
Medina Lake (I)	93	100	48	50	254,000 ac-ft
Lake Travis (FIMPRW)	87	95	73	80	1,144,000 ac-ft
Lake Kemp (IMW)	24	41	21	55	461,800 ac-ft
THE WEST					
ALBERTA					
Spray (P)	29	36	20	21	210,000 ac-ft
Lake Minnewanka (P)	47	56	44	32	199,700 ac-ft
St. Mary (I)	76	75	82	79	320,800 ac-ft
WASHINGTON					
Franklin D. Roosevelt Lake (IP)	4	26	43	78	5,232,000 ac-ft
Lake Chelan (PR)	29	62	66	75	676,100 ac-ft
IDAHO--WYOMING					
Upper Snake River (7 reservoirs) (IMP)	67	72	75	67	4,282,000 ac-ft
WYOMING					
Pathfinder, Seminoe, Alcova, Kortes, and Glendo Reservoirs (I)	73	78	77	43	3,016,000 ac-ft
Buffalo Bill (IP)	39	38	36	77	421,300 ac-ft
Boysen (FIP)	63	68	47	63	802,000 ac-ft
Keyhole (F)	90	89	81	35	199,900 ac-ft
COLORADO					
John Martin (FIR)	0	0	0	17	364,400 ac-ft
Colorado–Big Thompson project (I)	77	83	85	60	722,600 ac-ft
Taylor Park (IR)	71	86	72	74	106,000 ac-ft
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Navajo, and Blue Mesa Reservoirs (IFPR)	55	56	50	....	31,276,500 ac-ft
UTAH--IDAHO					
Bear Lake (IPR)	85	92	95	66	1,421,000 ac-ft
CALIFORNIA					
Hetch Hetchy (MP)	23	51	64	70	360,400 ac-ft
Lake Almanor (P)	75	79	96	59	1,036,000 ac-ft
Shasta Lake (FIPR)	100	97	103	92	4,377,000 ac-ft
Millerton Lake (FI)	66	70	98	81	503,200 ac-ft
Pine Flat (FI)	47	54	80	71	1,014,000 ac-ft
Isabella (FIR)	20	22	39	40	551,800 ac-ft
Folsom (FIP)	85	97	93	91	1,000,000 ac-ft
Lake Berryessa (FIMW)	86	83	98	87	1,600,000 ac-ft
Clair Engle Lake (Lewiston) (P)	96	99	101	95	2,438,000 ac-ft
CALIFORNIA--NEVADA					
Lake Tahoe (IPR)	78	85	93	69	744,600 ac-ft
NEVADA					
Rye Patch (I)	105	98	104	51	179,100 ac-ft
ARIZONA--NEVADA					
Lake Mead and Lake Mohave (FIMP)	67	67	65	66	27,970,000 ac-ft
ARIZONA					
San Carlos (IP)	9	7	0	17	948,600 ac-ft
Salt and Verde River system (IMPR)	45	41	44	46	2,073,000 ac-ft
NEW MEXICO					
Conchas (FIR)	40	36	51	....	352,600 ac-ft
Elephant Butte and Caballo (FIPR)	8	7	12	....	2,539,000 ac-ft

[a] Thousands of kilowatt-hours.

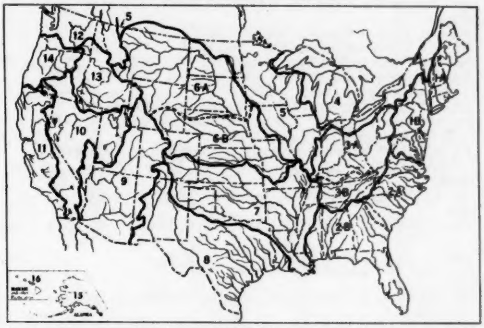
ANNUAL REPORTS ON QUALITY OF SURFACE WATERS IN THE UNITED STATES, 1941–67

For more than 60 years the U.S. Geological Survey has made quality-of-water investigations of the chemical and physical characteristics of the surface- and ground-water resources of the Nation. Many of the investigations carried on in cooperation with State and Federal agencies deal with the amounts of matter in solution and in suspension in streams. The results of practically all Survey investigations, including detailed chemical analyses, are assembled into reports that are published by the Geological Survey or by the cooperating agencies.

Since 1941, the Survey has published annual records of chemical quality, suspended sediment, and water temperature. These annual reports, in from 1 to 7 volumes each year, are a part of the Survey's series of water-supply papers. The reports are available for reference at many of the larger public and university libraries as well as at offices of the Geological Survey and cooperating agencies. The data are arranged by river basins, using the same regional and location numbering system as is used in the Survey's annual series of reports on stream discharge and contents of lakes and reservoirs. The boundaries of the regional areas, known as "parts," are shown on the accompanying map.

The annual Federal reports on water quality have been published for data collected through the end of September 1967 and reports containing more recent data are being prepared for publication. The report numbers of the published reports are listed in the accompanying table. In addition to the annual series of water-supply papers containing data by regions, the Geological Survey has published annual data since 1964 by States in a series of limited-edition, basic-data reports intended primarily to meet the needs of cooperating local, State, and Federal officials for reasonably current information. Data by States have been published for 1969 for most States and for 1970 for more than 20 States.

Since 1966, the investigations and analyses of water quality by the Survey, have been considerably broadened in scope and intensity. The development of new instruments for sensing and recording of a number of water quality parameters at the stream site have made it possible to continuously record specific conductance, pH, dissolved oxygen, temperature, and turbidity. Also, in addition to the chemical and physical data of previous years, the investigations include analyses for biological, microbiological, radiochemical, and organic parameters, where detailed information is required.



Map showing areas covered by the parts of the periodic reports on surface water supply of the United States. (For 1951 and subsequent years, parts 1, 2, 3, and 6 have been subdivided into parts 1A and 1B, 2A and 2B, 3A and 3B, and 6A and 6B, respectively, in the annual reports on surface water.)

Year, parts (regions), and report numbers of annual reports on quality of surface waters of the United States, 1941–67

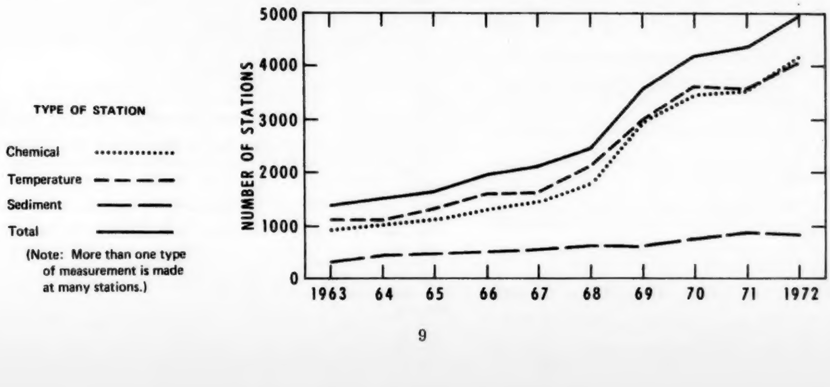
Water year (Oct.–Sept.) ending Sept. 30	Water-Supply Paper number					
	Parts 1–4	Parts 5–6	Parts 7–8	Parts 9–14	Alaska (part 15)	Irrigation stations [a](parts 5–14)
1941	942	942	942	942	....	....
1942	950	950	950	950	....	....
1943	970	970	970	970	....	....
1944	1022	1022	1022	1022	....	....
1945	1030	1030	1030	1030	....	....
1946	1050	1050	1050	1050	....	....
1947	1102	1102	1102	1102	....	....
1948	1132	1132	1133	1133	1372	....
1949	1162	1162	1163	1163	1372	....
1950	1186	1187	1188	1189	1372	....
1951	1197	1198	1198	1199	1466	1264
1952	1250	1251	1252	1253	1466	1362
1953	1290	1291	1292	1293	1466	1380
1954	1350	1351	1352	1353	1486	1430

Water year (Oct.–Sept.) ending Sept. 30	Water-Supply Paper number							
	Parts 1–2	Parts 3–4	Parts 5–6	Parts 7–8	Parts 9–11	Parts 12–14	Alaska (part 15)	Irrigation stations [a](parts 5–14)
1955	1400	1400	1401	1402	1403	1403	1486	1465
1956	1450	1450	1451	1452	1453	1453	1486	1485
1957	1520	1520	1521	1522	1523	1523	1500	1524
1958	1571	1571	1572	1573	1574	1574	1570	1575
1959	1641	1642	1643	1644	1645	1645	1640	1699
1960	1741	1742	1743	1744	1745	1745	1720	1746
1961	1881	1882	1883	1884	1885	1885	1953	1886
1962	1941	1942	1943	1944	1945	1945	1953	1946
1963	1947	1948	1949	1950	1951	1951	1953	1952
1964	1954	1955	1956	1957	1958	1959	1959	1960
1965	1961	1962	1963	1964	1965	[b]1966	1966	1967
1966	1991	1992	1993	1994	1995	[b]1996	1996	(a)
1967	2011	2012	2013	2014	(c)	(c)	(c)	(a)

[a]Series concluded in 1965; subsequent data (in mg/l rather than epm) incorporated in appropriate parts of regular series, such as in Water-Supply Papers 1993–1996 for water year 1966.
[b]Includes data for part 16 (Hawaii and other Pacific areas), but actual, part-16 analytical data contained in reports for 1965 and 1966 is for Okinawa only.
[c]In press or ready for publication.

NOTE: Prices at which the most recent reports listed above may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402, are as follows: "U.S. Geological Survey Water-Supply Paper" (WSP) number - - - WSP 1991, $4.00; WSP 1992, $2.50; WSP 1993, $2.75; WSP 1994, $3.50; WSP 1995, $3.00; WSP 1996, $2.00; WSP 2011, $4.00; WSP 2012, $2.45; WSP 2013, $2.50; WSP 2014, $3.50.

Water-quality measurement stations, 1963–72



FLOOD-PLAIN MAPS PUBLISHED IN THE HYDROLOGIC ATLAS SERIES

The list below identifies the many flood maps published by the U.S. Geological Survey as "hydrologic investigations atlases." Each atlas consists of a topographic map (or maps) or of a photomosaic base map on which is shown the area covered by one or more outstanding floods or by hypotnetical floods of specified frequencies. The scale of each map is 1:24,000, except where noted otherwise. Each flood map is accompanied by explanatory data that describe the stages and profiles of the flood.

These maps have been prepared in cooperation with State, county, and other governmental agencies. The flood maps are important planning documents for those zoning, planning, construction, and insurance groups concerned with the orderly development and economic use of flood-plain areas. Orders for any of the atlases listed below should be sent (with check or money order payable to the U.S. Geological Survey) to the Distribution Section, U.S. Geological Survey, 1200 South Eads St., Arlington, Va. 22202.

HYDROLOGIC INVESTIGATIONS ATLAS

Alabama

HA-408 Hurricane Camille tidal floods of August 1969 along the gulf coast, Grand Bay quad., Ala. 1969. $0.75.

Alaska

HA-294 Flood of August 1967 at Fairbanks, Alaska. 1967. $1.00.

California

HA- 54 Floods at Fremont, Calif. 1962. $0.75.
HA- 78 Floods near Fortuna, Calif. 1963. $0.75.
HA-348 Floods on Napa River at Napa, Calif. 1970. $0.75.
HA-422 Flood of January 1969 near Carpinteria, Calif. 1971. $1.00. (Photomosaic, scale about 1:12,000.)
HA-423 Flood of January 1969 near Ventura, Calif. 1971. $1.00.
HA-424 Flood of January 1969 near Azusa and Glendora, Calif. 1971. $1.00. (Photomosaic, scale about 1:6,000.)
HA-425 Flood of January 1969 near Cucamonga, Calif. 1971. $1.00. (Scale 1:6,000.)

Colorado

HA-41 Floods at Boulder, Colo. 1961. $0.50. (Scale 1:6,000.)

Florida

HA-66 Floods at Tampa, Fla. 1962. 2 sheets. $1.25 per set. (Scale 1:12,000.)

Georgia

HA-418 Floods in vicinity of Ellijay, Ga. 1971. $0.75.

Hawaii

HA-239 Floods in Kahaluu area, Oahu, Hawaii. 1966. $1.00. (Scale 1:12,000.)
HA-314 Floods in Waimanalo area, Oahu, Hawaii. 1968. $0.75. (Scale 1:12,000.)

Illinois (all northeastern Illinois)

HA- 39 Floods near Chicago Heights, Ill. 1960. $0.75.

Note: The title of each atlas below is "Floods in (name of quadrangle), Ill." Price is $0.75 each, unless noted otherwise.

HA- 67 Arlington Heights. 1963.
HA- 68 Elmhurst. 1963.
HA- 69 Highland Park. 1963.
HA- 70 Aurora North. 1963.
HA- 71 Wheeling. 1963.
HA- 85 Park Ridge. 1964.
HA- 86 Hinsdale. 1964.
HA- 87 Palatine. 1964.
HA- 88 Libertyville. 1964.
HA- 89 Joliet. 1964.
HA- 90 Harvey. 1964.
HA-142 Geneva. 1965.
HA-143 Lombard. 1964.
HA-144 Wadsworth. 1964.
HA-145 Palos Park. 1966.
146 Romeoville. 1965.
147 Elgin. 1965.
HA-148 Wheaton. 1965.
HA-149 Sag Bridge. 1966.
HA-150 Barrington. 1965.
HA-151 Fox Lake. 1965.
HA-152 Tinley Park. 1965.
HA-153 Blue Island. 1966.
HA-154 Naperville. 1965.
HA-202 West Chicago. 1965.
HA-203 Streamwood. 1965.
HA-204 Mokena. 1966.
HA-205 Lake Calumet. 1966.
HA-206 River Forest. 1966.
HA-207 Wauconda. 1966.
HA-208 Lake Zurich. 1966.
HA-209 Steger. 1966.
HA-210 Normantown. 1966.
HA-211 Manhattan. 1966
HA-226 Antioch. 1966.
HA-227 Sugar Grove. 1966.
HA-228 Plainfield. 1966.
HA-229 Elburn. 1966.
HA-230 Grayslake. 1967.
HA-231 Frankfort. 1967.
HA-232 Pingree Grove. 1967.
HA-233 Zion. 1967.
HA-234 Waukegan. 1967.
HA-251 Peotone. 1967.
HA-252 Berwyn. 1967.
HA-253 Crystal Lake. 1967.
HA-254 Elwood. 1967.
HA-255 McHenry. 1968.
HA-256 Woodstock. 1968.
HA-257 Beecher West. 1968.
HA-301 Dyer. 1968.
HA-302 Beecher East. 1969.
HA-303 Richmond. 1969.
HA-304 Wilton Center. 1969.
HA-305 Symerton. 1970.
HA-306 Wilmington. 1971.
HA-361 Huntley. 1971.
HA-362 Channahon. 1971. $1.00.
HA-363 Hebron. 1971. $1.00.
HA-458 Maple Park. 1972. $1.00.
HA-459 Hampshire NE. 1972. $1.00.

Iowa

HA-53 Floods at Des Moines, Iowa. 1963. $0.75.

Kansas

HA-14 Floods at Topeka, Kans. 1959. $0.75.
HA-63 Floods at Wichita, Kansas. 1963. 5 sheets. $2.50 per set.

Kentucky

HA-328 Floods on Levisa Fork in vicinity of Paintsville, Ky. 1969. $0.75. (Scale 1:12,000.)
HA-329 Floods on Licking River in vicinity of Salyersville, Ky. 1969. $0.75. (Scale 1:12,000.)
HA-342 Floods on Triplett Creek in vicinity of Morehead, Ky. 1969. $0.75. (Scale 1:12,000.)

Louisiana

HA-126 Flood of 1962 near Baton Rouge, La. (and data sheet on flood of 1964). 1965. $0.75.
HA-374 Flood of April 1968 at Many, La. 1970. $0.50. (Photomosaic, scale about 1:12,000.)

Massachusetts

HA-371 Flood of March 1968 on the Sudbury, Assabet, and Concord Rivers in Massachusetts. 1970. 2 sheets. $1.25 per set. (Photomosaics, scale about 1:12,000.)
HA-419 Flood of March 1968 on the Charles River, Mass. 1971. 2 sheets. $1.25 per set. (Photomosaic, scale about 1:12,000.)

Michigan

HA-59 Floods at Mount Clemens, Mich. 1962. $0.75. (Scale 1:18,000.)

Mississippi

HA-127 Flood on Pearl River at Jackson, Miss., in 1961. 1964. $0.50. (Photomosaic, scale about 1:21,000.)

Note: Title of HA-395 to HA-407 is "Hurricane Camille tidal floods of August 1969, (name of quadrangle), Miss." Each $0.75: 1969.

Mississippi—Continued (See note at bottom of left column.)

HA-395 Logtown.
HA-396 English Lookout, La.-Miss.
HA-397 Kiln.
HA-398 Waveland–Grand Island Pass.
HA-399 Vidalia.
HA-400 Bay St. Louis.
HA-401 Gulfport Northwest.
HA-402 Pass Christian.
HA-403 Gulfport North-South.
HA-404 Biloxi.
HA-405 Ocean Springs–Deer Island.
HA-406 Pascagoula. (Scale 1:62,500.)
HA-407 Kreole–Grand Bay Southwest, Miss.-Ala.

Nebraska

HA-188 Flood of August 1966 in the lower Loup River basin, Nebr. 1967. 2 sheets. $1.25 per set.
HA-258 Floods in Seward quad., southeastern Nebraska. 1967. $0.75.
HA-352 Flood of June 1967 at Grand Island, Nebr. 1970. $0.75.

New Jersey

HA- 65 Tidal floods, Atlantic City and vicinity, N.J. 1962. $0.50. (Scale 1:12,000.)
HA-104 Floods on Raritan and Millstone Rivers in Somerset County, N.J. 1964. $0.75.
HA-245 Floods on Millstone River and Stony Brook in vicinity of Princeton, N.J. 1967. $0.75.
HA-246 Floods at Easton, Pa.-Phillipsburg, N.J. 1967. $1.00.
HA-263 Floods on Delaware River in the vicinity of Belvidere, N.J. 1967. $1.00.
HA-359 Floods in upper Millstone River basin in vicinity of Hightstown, N.J. 1969. $0.75.
HA-378 Floods in Beden Brook basin in Somerset and Mercer Counties, N.J. 1970. $0.75.

New Mexico

HA-318 Flood of August 1966 at Carlsbad, N. Mex. 1968. $0.50. (Scale 1:14,000.)

New York

HA-297 Floods on Chenango River and Canasawacta Creek at Norwich, N.Y. 1968. $0.75. (Scale 1:12,000.)
HA-350 Floods on Susquehanna River at Oneonta, N.Y. 1969. $0.75. (Scale 1:20,000.)

North Carolina

HA-323 Floods on Boone and Winkler Creeks at Boone, N.C. 1968. $0.75. (Scale 1:4,800.)
HA-331 Floods on Little Buffalo Creek at West Jefferson, N.C. 1969. $0.50. (Photomosaic, scale about 1:5,500.)

Ohio

HA- 40 Floods at Mount Vernon, Ohio. 1964 (revised). $0.75. (Scale 1:12,000.)
HA- 43 Floods at Springfield, Ohio, in 1913 and 1959. 1961. $0.75.
HA- 44 Floods at Newark, Ohio. 1964 (revised). $0.75.
HA- 45 Floods at Chillicothe, Ohio. 1964. $0.75.
HA- 46 Floods at Zanesville, Ohio. 1964. $0.75. (Scale 1:12,000.)
HA- 47 Floods at Fremont, Ohio. 1962. $0.75.
HA- 48 Floods at Circleville, Ohio. 1964. $0.75. (Scale 1:12,000.)
HA- 49 Floods at Barberton, Ohio. 1962. $0.75.
HA- 50 Floods at Canton, Ohio. 1962. $0.75.
HA- 51 Floods at Warren, Ohio. 1963. $0.75.
HA- 52 Floods at Columbus, Ohio. 1962. $0.75. (Scale 1:31,680.)
HA- 56 Floods on Crab Creek at Youngstown, Ohio. 1963. $0.75. (Scale 1:2,400.)
HA-324 Floods at Amesville, Ohio. 1969. $0.75. (Scale 1:12,000.)
HA-325 Floods at Jackson, Ohio. 1968. $0.75. (Scale 1:12,000.)

Oregon

HA-388 Floods on Elk Creek, Douglas County, Ore. 1971. $1.00. (Photomosaic, scale about 1:24,000.)

Pennsylvania

HA- 57 Floods at Harrisburg, Pa. 1961. $0.75. (Scale 1:31,680.)
HA-246 Floods at Easton, Pa.-Phillipsburg, N.J. 1967. $1.00.
HA-248 Floods on Schuylkill River from Conshohocken to Philadelphia, Pa. 1967. $1.00 (Scale 1:16,000.)

Puerto Rico (all maps at scale of 1:20,000)

HA- 77 Floods at Bayamon and Catano, P.R. 1962. $0.75.
HA-128 Floods at Toa Alta, Toa Baja, and Dorado, P.R. 1964. $0.75.
HA-261 Floods in the Ponce area, P.R. 1967. $0.75.
HA-262 Floods at Barceloneta and Manati, P.R. 1967. $0.50.
HA-265 Floods at Humacao, P.R. 1967. $0.75.
HA-271 Floods at Arecibo, P.R. 1968. $0.75.
HA-288 Floods in the Mayaguez area of Puerto Rico. 1968. $0.75.
HA-289 Floods in the area of Vega Alta and Vega Baja, P.R. 1968. $0.75.
HA-375 Floods in the Anasco area, P.R. 1971. $0.75.
HA-382 Floods in the Yabucoa area, P.R. 1971. $1.00.
HA-414 Floods in the Guayanilla-Yauco area, P.R. 1971. $1.00.
HA-445 Floods in the Patillas-Maunabo area, P.R. 1971. $1.00.
HA-446 Floods in the Guayama area, P.R. 1971. $1.00.
HA-447 Floods in the Salinas area, P.R. 1971. $1.00.
HA-448 Floods in the Santa Isabel area, P.R. 1971. $1.00.

Texas

HA-190 Flood on Big Fossil Creek at Haltom City, near Fort Worth, Tex., in 1962. 1965. $0.75.
HA-238 Floods on White Rock Creek at Dallas, Tex., in 1962 and 1964. 1967. $1.00.
HA-240 Flood of October 8, 1962, on Bachman Branch and Joes Creek at Dallas, Tex. 1966. $1.00.

Virginia

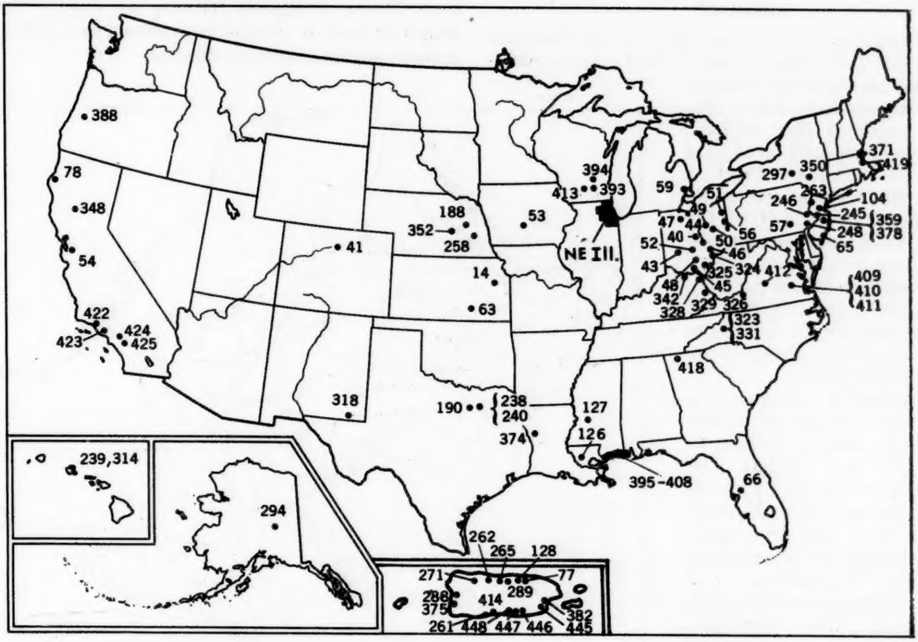
HA-326 Floods on Johns and Craig Creeks in Craig County, Va. 1968. $0.75. (Scale 1:12,000.)
HA-409 Flood of August 1969, Bon Air quad., Richmond, Va. 1969. $0.75.
HA-410 Flood of August 1969, Richmond quad., Richmond, Va. 1969. $0.75.
HA-411 Flood of August 1969, Drewrys Bluff quad., Richmond, Va. 1969. $0.75.
HA-412 Flood of August 1969 on Maury River at Buena Vista, Va. 1969. $0.50. (Photomosaic, scale about 1:12,000.)

Wisconsin

HA-393 Floods on Rock River in northern Rock County, Wis. 1970. $0.75. (Scale 1:16,000.)
HA-394 Floods on Rock River in northeastern Jefferson County, Wis. 1971. $1.00.
HA-413 Floods on Rock River in southwestern Jefferson County, Wis. 1971. $0.75.

OUTLINE MAPS OF THE UNITED STATES AND PUERTO RICO SHOWING THE LOCATION OF FLOOD-PLAIN MAPS PUBLISHED IN THE SERIES OF HYDROLOGIC INVESTIGATIONS ATLASES

The numbers on the map correspond to those listed on the opposite page. No numbers are shown on the U.S. map in northeastern Illinois because of the small scale of this map; 62 atlases have been published to cover the solid-block area of Illinois shown on this map.



WATER RESOURCES REVIEW MAY 1972

Cover map shows generalized pattern of streamflow for May based on 22 index stream-gaging stations in Canada and 130 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations which are located near the points shown by the arrows.

Streamflow for May 1972 is compared with flow for May in the 30-year reference period 1931–60 or 1941–70. Streamflow is considered to be *below normal* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow for May is considered to be *above normal* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile).

Flow higher than the lower quartile but lower than the upper quartile is described as being within the *normal range.* In the Water Resources Review *normal flow* is defined as the median of the 30 flows of May during the reference period. The normal (median) has been obtained by ranking those 30 flows in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the normal (median).

The normal is an average (but not an arithmetic average) or middle value; half of the time you would expect the May flows to be below the median and half of the time to be above the median. Shorter reference periods are used for the Alaska index stations because of the limited records available.

Statements about *ground-water levels* refer to conditions near the end of May. Water level in each key observation well is compared with average level for the end of May determined from the entire past record for that well or from a 20-year reference period, 1951–70. *Changes in ground-water levels* unless described otherwise, are from the end of April to the end of May.

The Water Resources Review is published monthly. Special-purpose and summary issues are also published. In the United States, issues of the Review are free on application to the Water Resources Review, U.S. Geological Survey, Washington, D.C. 20242.

This issue was prepared by J.C. Kammerer, H.D. Brice, E.W. Coffay. and L.C. Fleshmon from reports of the field offices, June 9, 1972.

WATER QUALITY OF STREAMS IN THE NESHAMINY CREEK BASIN, PENNSYLVANIA

The accompanying abstract (abridged), map, and graph are from the report, *Water quality of streams in the Neshaminy Creek basin, Pennsylvania*, by E.F. McCarren: U.S. Geological Survey Water-Supply Paper 1999-0, 33 pages, 1972; prepared in cooperation with the Commonwealth of Pennsylvania Department of Environmental Resources. Water-Supply Paper 1999-0 may be purchased for $0.30 from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

ABSTRACT

The Neshaminy Creek, a tributary of the Delaware River, drains 236.5 square miles of rural countryside in Bucks and Montgomery Counties in southeastern Pennsylvania (fig. 1). The perennial flow of fresh water, which basically is of good quality, in Neshaminy Creek is used for public supply and recreation. In the lower half of the drainage basin, the average discharge of the main stream exceeds 146 mgd (million gallons per day), part of which is regularly diverted and moderately treated for distribution to consumers living in the suburbs of Philadelphia.

The Neshaminy has carved a scenic route on its way to the Delaware River, thereby helping to increase the value of land. The unabated growth of nearby metropolitan areas and the multiplying needs for water and open space for water storage and recreation in southeastern Pennsylvania have become impelling forces that mark the Neshaminy valley watershed for continued development of its land and water resources. Toward this end the Neshaminy Valley Watershed Association, Inc., which came into existence June 13, 1956, is one of several organizations dedicated to land and water-resources development in the Neshaminy Creek basin.

This study shows that there is a wide variance in water quality between the West Branch and the North Branch of the Neshaminy. However, the study shows no significant difference between the chemical composition of the Little Neshaminy Creek and the main stream before they come together at Rushland. Just beyond their confluence the main stream has drained more than half its total drainage area. The average flow of the stream at this location is about 85 percent of the average flow at Langhorne.

The continued presence of game fish in most of Neshaminy Creek indicates a degree of water purity that characterizes this stream as suitable for recreation. However, during the summer and early fall, several small streams feeding the Neshaminy go dry. The diminished flow during these periods and during prolonged drought impairs stream quality by causing a greater concentration of dissolved solids in water (fig. 2). The relatively inferior water during low-flow periods, therefore, necessitates providing more water of good quality to reservoirs for emergency releases, not only to augment supply to users in needful downstream areas but also to improve stream quality by dilution.

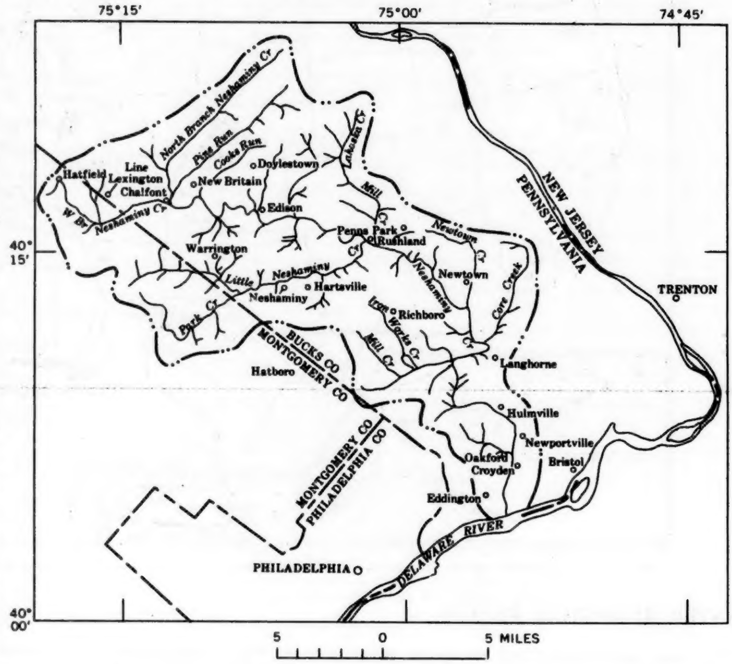


Figure 1.—Stream map, Neshaminy Creek basin.

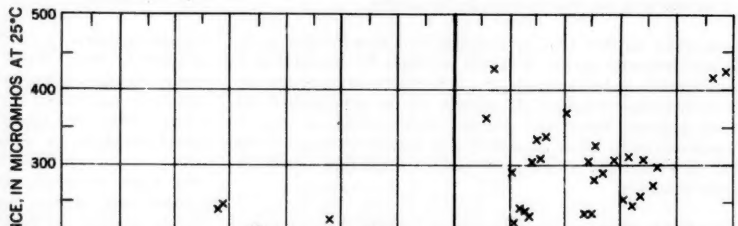


Figure 2.—Specific conductance prior to 1950 and during the drought of the 1960's, Neshaminy Creek near Langhorne. (At this site, dissolved-solids content, in milligrams per liter, equals approximately: 0.6 × specific conductance, plus 5.)

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